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Assessing the vulnerability of tropical fisheries: examples from the Caribbean

Vera Agostini, Senior Scientist, The Nature Conservancy

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COASTAL RESILIENCE

Adapting Natural and Human Communities to Sea Level Rise and Coastal Hazards

UNITED NATIONS UNIVERSITY

azavea

ASFPM Association of State Floodplain Managers

USGS science for a changing world

The University of Southern Mississippi

NOAA National Oceanic and Atmospheric Administration U.S. Department of Commerce

natural capital PROJECT

COASTAL RESILIENCE

Adapting Natural and Human Communities to
Sea Level Rise and Coastal Hazards

Assessing Risk and Vulnerability

Identifying Adaptation Solutions

Taking Action

Measuring Effectiveness

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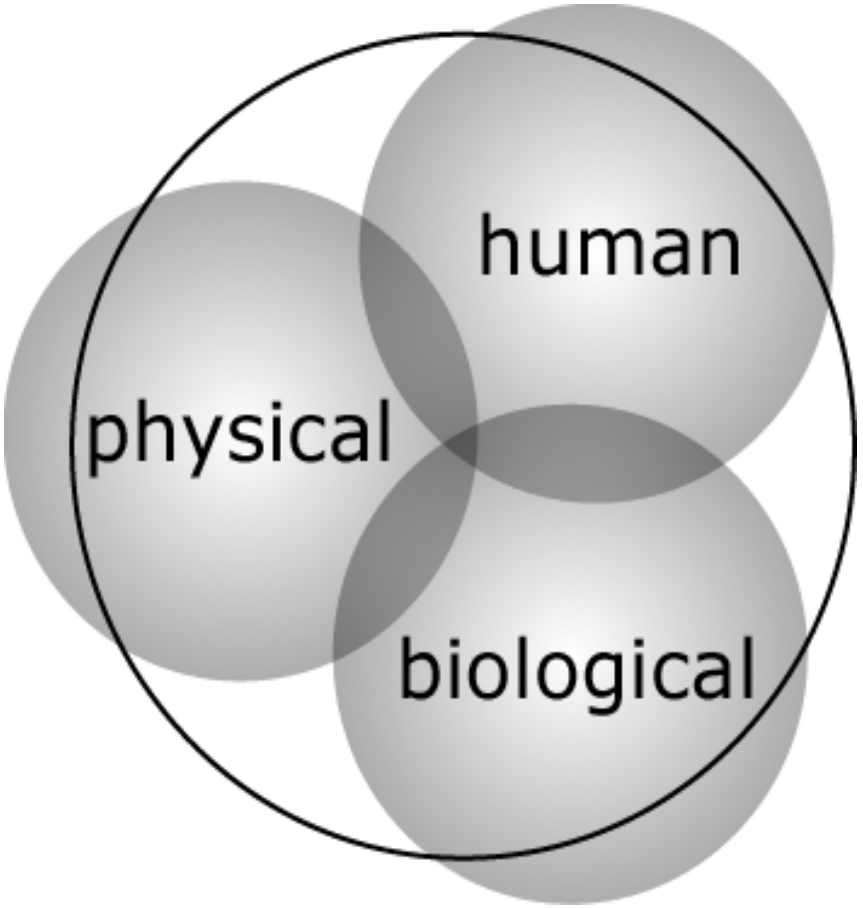
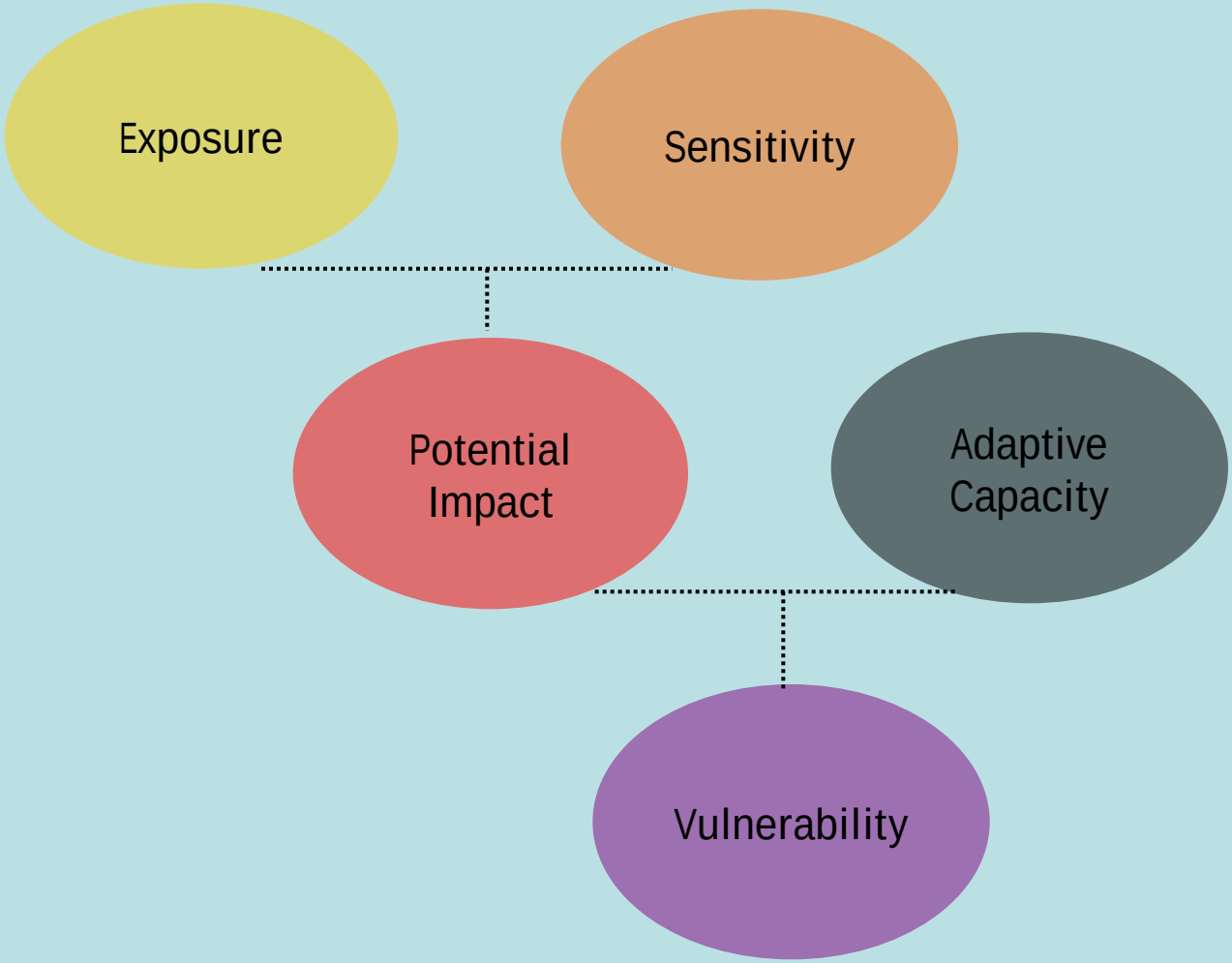
What is a fishery?

A fishery as a linked socio-ecological system



Framework



Based on IPCC definition

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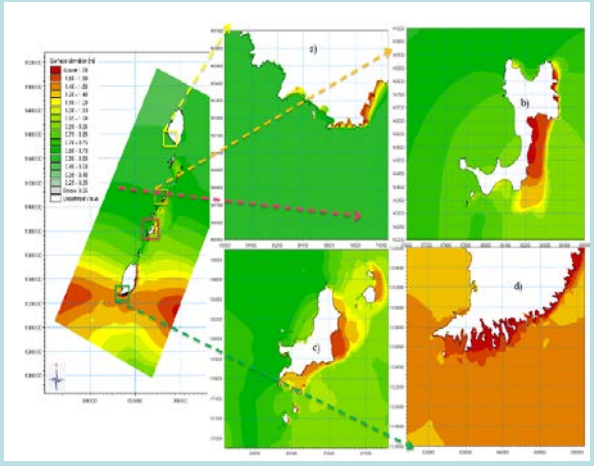
Data

Government data

Expert mapping

Community surveys

Modeling



Indicators

Livelihood Sensitivity Index Description and Rational of Variables

Variable	Measure of variable per enumeration district	Reason	Affect on Sensitivity
ED income from non natural resource related industries	Percentage of t… …ce in ED who reporte… …rce related in… industry	The higher the percent of total income derived from non natural resources vulnerable to climate change the less sensitive	Higher percentage = less sensitive
ED income generated by fisheries	Percer… who re… …ry industry	The higher the percent of total income derived from natural resources vulnerable to climate change the more sensitive	Higher percentage = more sensitive
ED income generated by tourism	Percent o… …who report…d hot… …s as thei… …mary indust… …work	The higher the percent of total income derived from natural resources vulnerable to climate change the more sensitive	Higher percentage = more sensitive
Critical fisheries facilities	T… number of critical fisheries facilities (landing sites, fish markets, ship-building, emergency gear storage, general gear storage) in ED.	Multiple fisheries facilities reduces an ED sensitivity (although it increases exposure)	Higher number = less sensitive
Critical tourism facilities	Total number of critical tourism facilities (hotels, marina, dive-shops) in ED.	Multiple tourism facilities reduces an ED sensitivity (although it increases exposure)	Higher number = less sensitive
Types of fishing facilities	Number of types of fishing facilities in ED.	The fewer types of fishing facilities the more sensitive to storm events	Fewer types = more sensitive
Types of tourism facilities	Number of types of tourism facilities in ED.	The fewer types of fishing facilities the more sensitive to storm events	Fewer types = more sensitive
TOTAL Livelihood Sensitivity Index	Sum of all scaled variables, scaled.	Livelihoods are an important aspect of community structure. Natural resource based livelihoods can experience greater detrimental effects from climate change than non-natural resource based industries.	

Note: Adapted from Wongbusarakum and Loper 2011

Critical fisheries facilities

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Expert feedback

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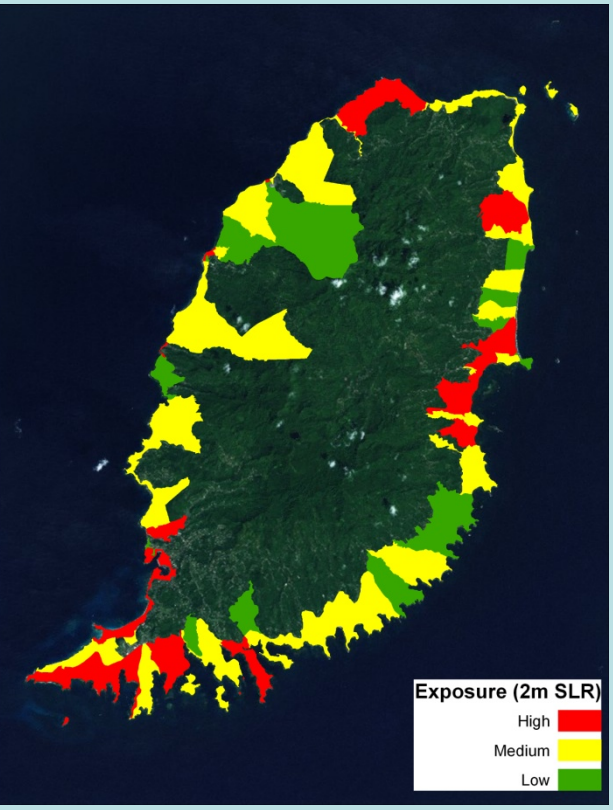
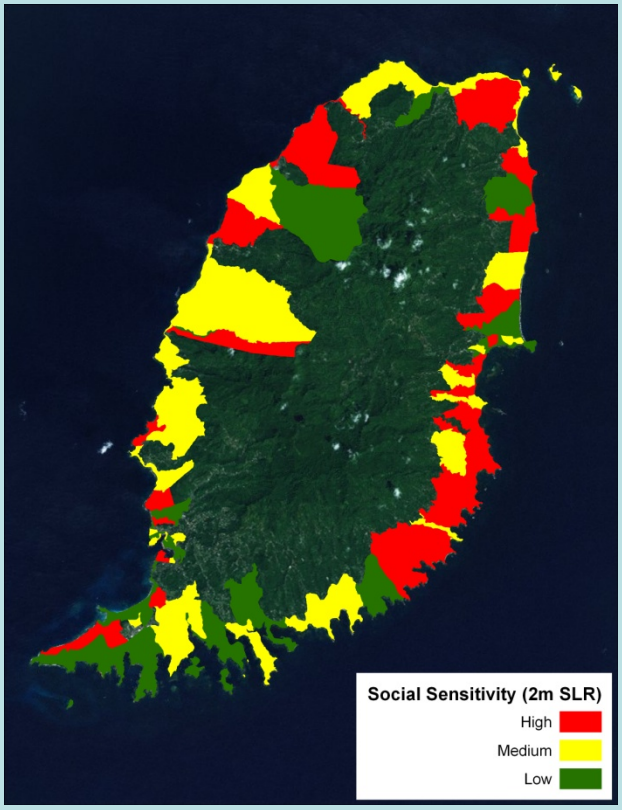
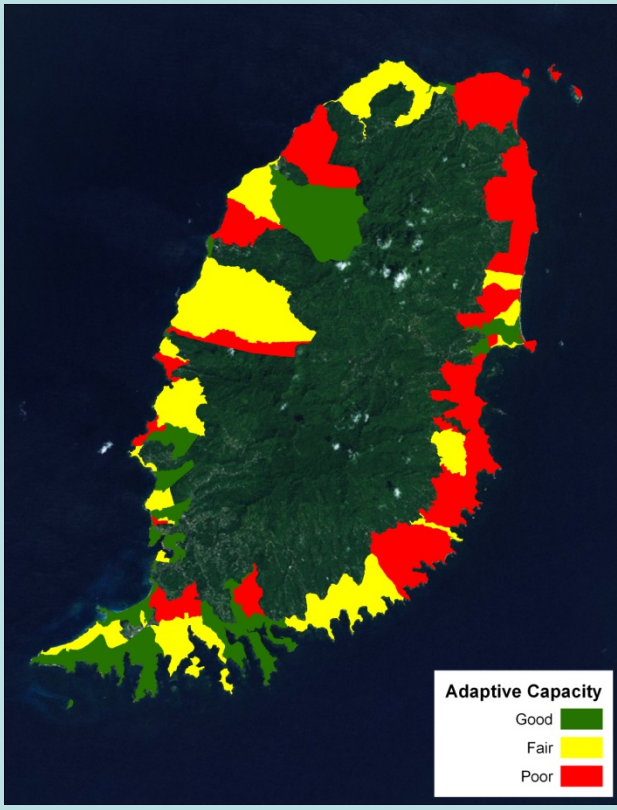
Mapping



EXPOSURE (2m SLR)



SOCIAL SENSITIVITY



ADAPTIVE CAPACITY

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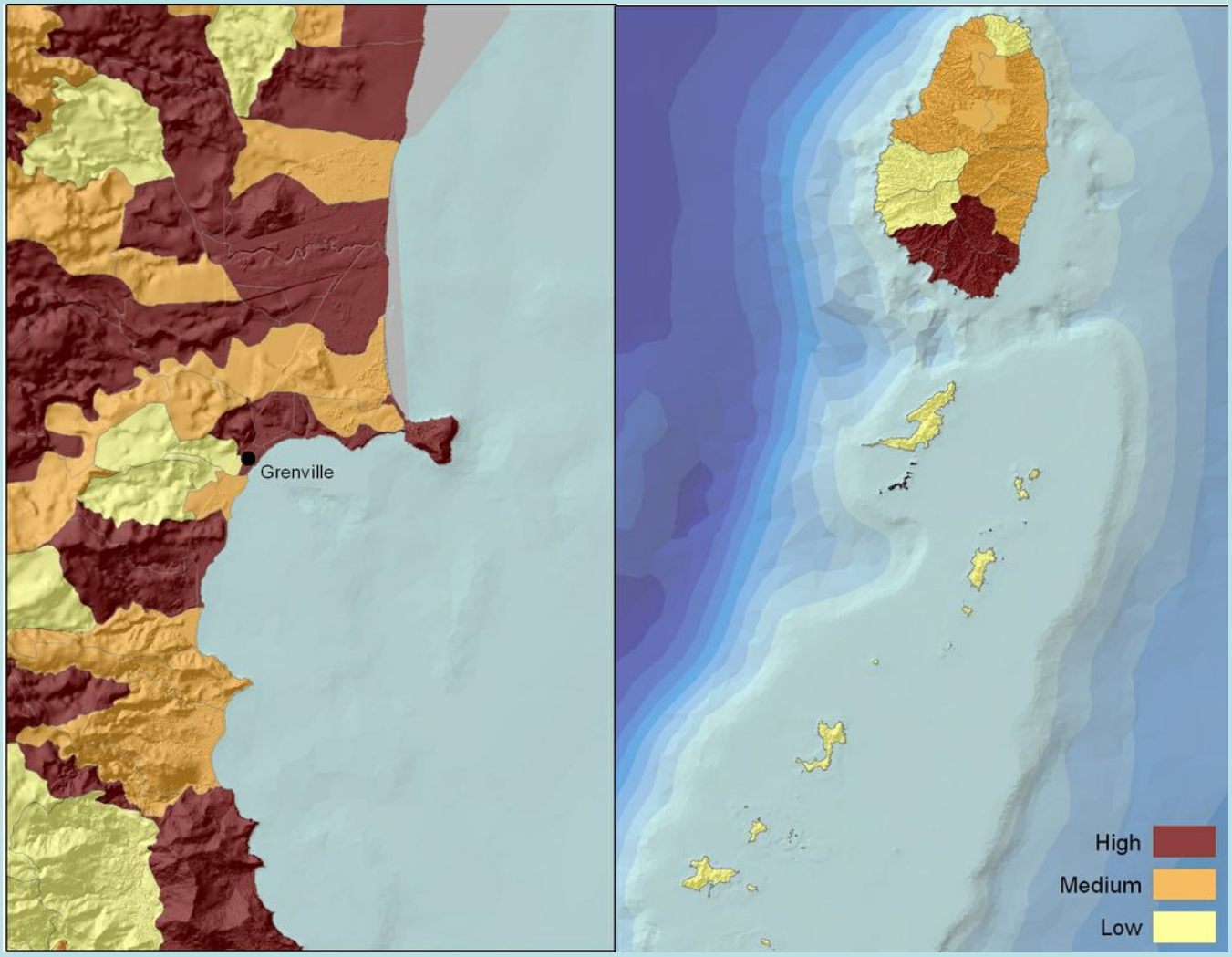
Mapping



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Future directions

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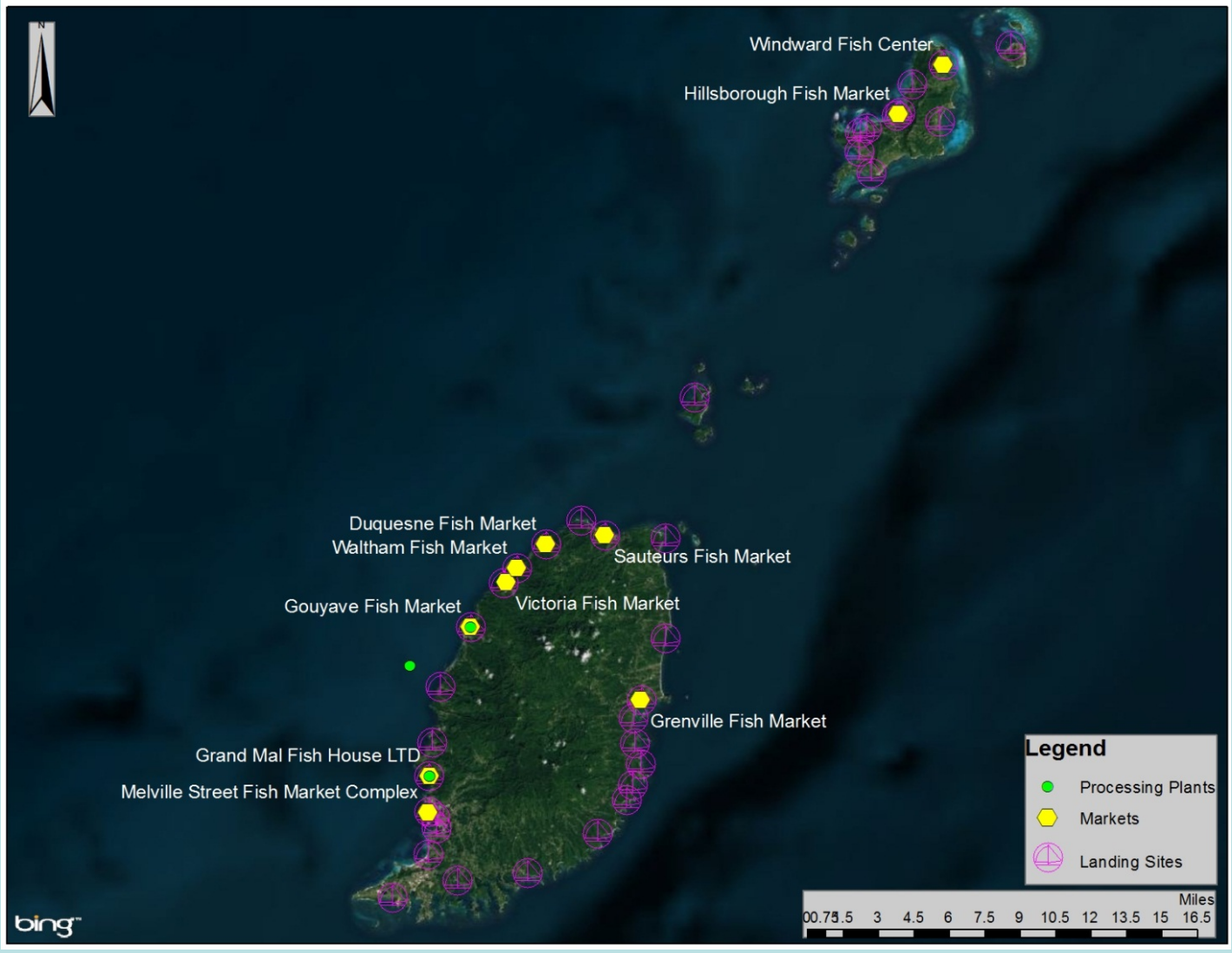
Future directions



Challenges

- Defining the scale of the assessment – what is realistic given available data?
- Accessing spatial information to assess impacts - ecological and social
- Linking ecological impacts to hazard not traditionally addressed

Opportunities

- Establishing novel partnerships (e.g. Red Cross) for site level assessments
- Channeling development/aid related climate change funds
- Addressing gaps in classic fisheries vulnerability assessments
- Linking science, practice, and policy within project platforms

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From assessment to management

Management of resources (practices and preparedness)

Habitat restoration/enhancement/protection

Development planning (infrastructure, livelihood)

Financial incentives

Community mobilization

Adaptive Capacity Index Description and Rational of Variables

Variable	Measure of variable per enumeration district	Reason	Affect on Sensitivity
Highest Level of Education Attained (Human & Civic Resources)	Percentage population in ED with high school degree or equivalent.	Education is a measure of human capitol. The greater human capitol that a community possesses the more able it is to adapt to changing circumstances. Education level also indicates levels of competence. Lower education constrains the ability to understand warning information and access to recovery information.	Higher % = more adaptive
Access to Social Networks (Human & Civic Resources)	Percentage of population in ED with some religious affiliation.	Social networks, such as religious communities, promote social relationships, close social bonds that facilitate cooperative action, and linkages via which ideas and resources are accessed. Access to these types of capital increases a communities overall adaptive capacity.	Higher % = more adaptive
Available workforce (Human & Civic Resources)	Percentage of population in ED in the workforce (i.e. age 15 or older)	Population in the workforce is an indicator of human resources available for adaptation after meeting other pressing needs.	Higher % = more adaptive
Diversity of Industries (Economic)	Standard deviation of distributed workforce across industries within an ED.	Reduced livelihood options can constrain a populations' potential for rapid economic recovery after a disaster. It is also an indicator of the ability of the labor force to adapt to new industries in response to fluctuations in market needs. Communities with a workforce that is more evenly distributed across industries will be more adaptable as industry patterns shift.	Lower STDV = more adaptive
Households with Insurance (Economic)	Percentage of households with dwelling insurance	Access of population to resources to help recover after a disaster.	Higher % = more adaptive
Health Insurance (Health)	Percentage of population with health insurance.	Access of population to basic services to buffer against health issues related climate change or disasters.	Higher % = more adaptive
Education enrolment (Health)	Percentage of population enrolled part or full time.	The Human Development Index (HDI), uses education enrolment as an indicator for assessing the human condition at the country level. More recently, the American Human Development Index (AHDI) measures the well-being among states in the US. (from cutter 2009)	Higher % = more adaptive
TOTAL Community Adaptive Capacity Index	Sum of all scaled variables, scaled.	Human and civic resources are a critical component of the coping and adaptive capacity of communities. This category includes literacy, level of education, access to retraining programs, and other factors that determine how flexible individuals may be in adapting to new employment opportunities or shifts in living patterns brought about by climate variability or change.	Higher score = more adaptive

Note: Adapted from Moss et al 2001 and Shepard et. al, 2011